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was as docile as the young chimpanzee, which I also saw. It has been asserted, however, on good authority, that the young gorilla is sometimes perfectly untamable. All the authorities upon the habits of the gorilla are cited by Professor Huxley in his "Man's Place in Nature," with the exception of a curious passage in Monboddo's "Origin and Progress of Language" (vol. i. p. 281). M. Du Chailu, in his "Journey to Ashango Land," also gives some details which are interesting, rather as tending to confirm what was previously known, than as throwing any new light upon the subject.

In fact, there is nothing remarkable in the habits of the gorilla, nothing which broadly distinguishes it from the other African apes, nor even from the ourang outang, which also builds a nest, which also assumes the erect posture now and then, and which also charges when wounded or brought to bay.

THE MOSS-ANIMALS, OR FRESH WATER POLYZOA.

PLATE 5.

BY ALPHEUS HYATT.

(Concluded from page 136.)

ALTHOUGH *Fredericella* has been more particularly referred to in the preceding Articles, they are, with one exception, almost equally applicable to all of the *Phylactolæmata*. This exception is the round disc, or *lophophore*, which in the other four genera changes to a horse shoe shape. (Compare Plate 3, fig. 4, with Plate 4, fig. 1.)

These four have, like the *Fredericella*, very euphonious names, *Plumatella*, *Pectinatella*, *Lophopus*, and *Cristatella*; and, while preserving a general identity, vary

extremely in the details of their anatomy and habits of life.

The Plumatellæ abound near the shores of our ponds, close to the surface, and are generally found with *Fredericella*. Better fitted, however, to endure the sun's rays, they sometimes seek places more exposed to their influence.

One sultry summer day, while searching for Polyzoa under the shelter of a bridge, my attention was drawn to the long water-grasses farther out in the stream, where, to my surprise, I found a specimen of *Plumatella Arethusa*, its tiny branches and living crystalline flowers glittering in the light as they swayed in the current unprotected from the heat.

The colony is like that of *Fredericella*, and in some species the unpractised eye would not detect the difference until the horseshoe-like discs were discovered. In others, however, such as *Plumatella vitrea*, the outer envelope remains gelatinous and transparent in the adult as in the young, and the tubes, or polypides, are in groups of two and more, counting sometimes twenty plumes.

The colony is dendritic, but the branches are always creepers along the surface, and there are no constrictions between the polypides, the branch being merely an elongated, undivided sac. It approximates, in this respect, to the next genus, *Lophopus*, and would belong to it, but that the statoblast has the plain, oval annulus of its compatriots among the Plumatellæ, which ranks it with them.

Lophopus has, also, lobiform branches, but they are supported in an erect posture by the ectocyst, a lump of clear jelly in which they are buried. The whole colony is very minute, the polypides are all gathered at the ends of the branches, and no longer occupy separate cells as in

Fredericella and most of the Plumatellæ. In the United States, Lophopus is very rare, only one specimen having been found in the Schuylkill River, near Philadelphia. In England, it is abundant upon the stems of floating duck-weed (*Lemna*) and other fresh-water plants.

My first introduction to Pectinatella and Cristatella took place some years since at Pennissewasse Pond, in Maine, one of the smallest of the liquid gems adorning that State.

Induced by the representations of a scientific friend, I visited the pond late in September, and its unexpected treasures kept me a willing loiterer for several succeeding weeks. The season was charming, full of haze and color, with an occasional leaf drifting through the still air, to remind one that the funeral cortege of the summer was passing down the year. Our way to the pond led us through a tortuous, shallow channel, studded with the blackened trunks of trees, the remains of a grove that had once overshadowed the spot where we now floated. I learned that earlier in the season this channel was much deeper, wholly submerging the shattered stumps, which were covered by luxuriant growths of Pectinatellæ, hanging over them like ivy over ruined towers. At this season, however, they were bare, the Polyzoa having sought the cooler depths of the pond.

Passing under a picturesque bridge, we entered the main lake, a long expanse with undulating shores, more like a river than a lake. One could readily imagine it winding on to the distant hills, closing the view to the northward, and the old logs which here and there lifted their sun-baked heads above the autumnal-tinted waters, half reclining with the current, added another river-like feature to the scene. We selected the oldest of these as most likely to furnish us with the objects of our search.

It was firmly imbedded, but when we finally succeeded in bringing the under side in view, the rich harvest of specimens amply rewarded our labors.

No marine or fresh-water animals of our northern climate excel the *Pectinatellæ* in beauty, or equal them in the tropical profusion with which they grow. The clusters, some as large as our heads, others broad and flat, were covered by hexagonal figures about an inch in diameter, traced by the plumed tubes of thousands of Polyzoa. Each hexagonal pattern, and there were hundreds in some settlements, was a separate colony. The deep, amber-color of the gelatine beneath shone through their central spaces, and each thread of the dense fringe surrounding them was stained with a tiny scarlet dot, the mouth of a polypide; the outline of one of these is given in Plate 4.

The cause of so many being assembled on one common deposit of jelly, is not the least curious fact in the history of the genus. A minute examination proves that a colony of *Pectinatella* is little more than a hollow case, distended by the fluids within, which prevent the soft walls from collapsing, and support the polypides protruding from the upper side in radiating lines. When this hollow case, or cœnœcium, attains the length of an inch, or an inch and a half, a crease shows itself as if a cord had been drawn tightly about the soft walls. This, deepening, finally cuts the colony into two smaller ones, and these, as they grow, divide into four, which in turn divide into sixteen, and so on. Where this increase is very rapid, the interior colonies are forced to expand upward, and, adding to the gelatine as they rise, build up, in some instances, clusters several feet in diameter, and eight or more inches in thickness.

Side by side with these, occurred thin patches of gelatine covered with what at first appeared a different species of *Pectinatella*. The central spaces of the colonies, however, were long and narrow, and much less brilliant, being surrounded by tawny-colored fringes of *Polyzoa*. This genus discards even the remnant of a branch which we mentioned in the lobes of the *Pectinatella*, and is a hollow sac flattened into a disc below, by which the whole colony move upon the gelatine or ectocyst as one animal.

In *Fredericella*, the hard, parchment-like condition of the ectocyst was owing wholly to the age of the colony; in the young, it was gelatinous.

We have seen, also, that *Lophopus* was buried in its own ectocyst, which remained gelatinous throughout life, and that the *Pectinatellæ*, though firmly attached, simply rested on theirs. And we now see *Cristatella* making the last step in this process, becoming entirely independent of its ectocyst, which is only a transient secretion thrown off from the creeping disc, like slime from the foot of a snail, to smooth the path over which it crawls. In large settlements the colonies lie closely together, but it is not infrequent to meet with a stray one wandering by itself. Locomotion is accomplished by a complete net-work of muscles within the sac. These, with perhaps other muscles in the walls, enable them to expand the disc in any direction, and then secreting gelatine, and holding to what they have thus gained, draw up their remaining portions. They move so slowly, however, that minute colonies require a day to get over an inch on the side of a smooth glass dish, the larger colonies progressing even more sluggishly. In Plate 5, the outline of a single polypide is given, with a portion of the net-work of internal muscles.

Cristatella is no exception in the animal kingdom; there are many instances in which compound animals move and act in unity. But here there is some hope of solving this mysterious diversity of number, with unity of will and purpose.

The nervous system, wherever it is present, whether in the distinct form of brain, nerve-mass, or ganglion, is essentially the medium of sensation and of motive power.

Now if the nervous system among the Polyzoa is a compound system, having a common trunk with branches leading off into each Polyzoön, a sensation in the main body could be conveyed to each individual, and thus the will of every minute tube be brought into harmony with all, causing the whole to move like one creature.

Fritz Müller, a German naturalist, has actually ascertained that in one of the marine species of *Seriolaria*, the nerves followed up the hollow trunk and branches of the colony like the dark wood in the heart of a tree, supplying each animal with a nerve. He noticed that if the trunk of the colony was irritated, that all the Polyzoa withdrew their plumes as if alarmed, and this led him to investigations, which resulted in such important discoveries.

Whether all the polypides in a colony of *Cristatella* unanimously resolve to move, or whether the majority rule and drag the minority at will, or whether again the desire to move is excited in the central nerve-trunk by external causes, has not yet been determined.

One thing, however, seems probable, that the unanimity of action in the little republic is due to the union of the various individualized nervules into branches, and finally into one grand trunk, otherwise parts of the movable sac might be travelling in opposite directions at the

same time, from the sides as well as from the ends, and the colony be broad and sedentary, instead of long, narrow, and progressive.

EXPLANATION OF PLATE 5. *Cristatella ophidioidea* Hyatt.

Fig. 1. Magnified view of one Polypide, isolated, showing at E (above) the upper surface of the sac, or cœnocœcium, and at E (below) the creeping disc, and at Q, Q, the meshes of the internal muscles, which aid in locomotion. M, M', M'', muscles which retract the tube and plume, retractors. N, muscles which retain the fold, which is reduced in this genus to a circular constriction, and devoid of the muscles marked N', in preceding plates. Z, clear spaces in the wall of the arm. O, the bases of muscles which move the tentacles; the upper portions of these are seen in Fig. 7.

Figs. 2, 3, and 4. Upper and lower side, and profile view of the statoblast. W', horny sheath; W'', annular sheath; W''', spines, only eight and five pairs of these are figured, there are in nature twenty-two short and thirty-two long spines.

Fig. 5. View of intestine with upper part of stomach and lower part of throat in the background. K, throat; K', stomach; K'', intestine; K̄, anus.

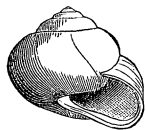
THE LAND SNAILS OF NEW ENGLAND.

BY EDWARD S. MORSE.

(Continued from page 151.)

HELIX HORTENSIS *Muller*. (Fig. 16.) Shell nearly globular, smooth, shining, yellow. Whorls five, convex,

Fig. 16. spire somewhat elevated, suture at extremity of last whorl curved toward the aperture. Lip slightly reflected, white, and having a thickened margin within the shell; the reflected condition of the lip disappearing at the base of the shell. Aperture rounded; umbilicus absent. The base of the shell is quite convex. Specimens are sometimes found with one or more brown bands revolving with the whorls. Animal blackish, tinged with brown; creeping disc inky; extremity dirty flesh-color.





HYATT ON THE MOSS ANIMALS.